(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 162 125 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
12.12.2001 Bulletin 2001/50

(51) Int Cl.[7]: **B62D 1/06**, B27H 7/00, B27D 1/08

(21) Application number: **01113708.0**

(22) Date of filing: **05.06.2001**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **06.06.2000 IT MI001252**

(71) Applicant: **CAVALLI S.r.l.**
21040 Cislago (IT)

(72) Inventor: **Cavalli Luigi**
21047 Saronno (IT)

(74) Representative: **Bongiovanni, Simone (IT) et al**
Studio Torta S.r.l
Via Viotti 9
I-10121 Torino (IT)

(54) Method of producing vehicle steering wheels, in particular wooden steering wheels with a quality material covering; and steering wheels produced using such a method

(57) A method of producing wooden steering wheels with a quality material covering, wherein a semifinished part (10) is formed from an agglomerate of wood fibers, and is defined by a body (2) in the shape of at least a curved ring portion corresponding to the shape of the steering wheel being produced and having a longitudinal projection (7) having a concave work surface (9); the part (10) is used as a bottom die to apply a covering (13) of quality material, e.g. brier, kevlar or aluminium; for which purpose, the covering (13) is applied to the work surface (9) of the part (10), between the part (10) acting as a bottom die and a corresponding top die (14); a corresponding curved half-shell (17) is then machined from the part (10) and applied to a core portion (19) of the steering wheel being produced.

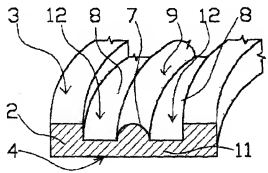


Fig. 3

EP 1 162 125 A2

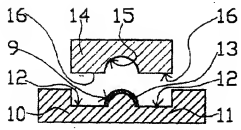


Fig. 4

Description

[0001] The present invention relates to a method of producing vehicle steering wheels, in particular, wooden steering wheels with a quality material covering; and to steering wheels produced using such a method.

[0002] Wooden steering wheels are known to be produced from sheets of laminated wood, which are glued to one another to a predetermined thickness and then cut into blocks, on one side of the blocks, a groove is formed for connection to the steering wheel core; pairs of blocks are glued on opposite sides of the steering wheel and machined to the desired finished form; and further finishing operations are performed to complete the process.

[0003] The above method, by involving a preliminary step to prepare the blocks from the laminated sheets, and, in particular, a long, complex series of machining operations, is on the whole relatively complex, time-consuming and expensive. Moreover, once fitted to the steering wheel, the wood cannot always be machined, especially when particular shapes are required; using laminated wood results in a relatively heavy steering wheel; and steering wheels so produced are not altogether satisfactory in appearance unless provided with a quality material covering, which calls for a further, equally complex, high-cost application process.

[0004] It is an object of the present invention to provide a method of producing wooden steering wheels, designed to eliminate the aforementioned drawbacks of known methods, and which, in particular, is straightforward and cheap to implement, and provides for obtaining lightweight, high-quality, relatively low-cost steering wheels.

[0005] According to the present invention, there is provided a method of producing vehicle steering wheels, in particular wooden steering wheels with a quality material covering, characterized by comprising the steps of:

- forming a semifinished part from an agglomerate of wood fibers; said part being defined by a body in the shape of at least a curved ring portion corresponding to the shape of the steering wheel being produced, and comprising a longitudinal projection having a concave work surface;
- using said part as a bottom die to apply a covering of quality material; said covering being applied to said work surface of said part, between said part acting as a bottom die and a corresponding top die;
- forming from said part a corresponding curved half-shell of such a shape and size as to fit onto a core portion of the steering wheel being produced; and
- applying said half-shell onto said core portion.

[0006] Here and hereinafter, the term "agglomerate of wood fibers" is intended to mean a material used particularly in the furniture industry and comprising cellulose/wood fibers mixed and hot pressed together using polymer resin binders. Typically, the wood fibers comprise wood chips of various sizes, derived, for example, from waste material from the wood-working industry or recycled wood. Such materials are known as MDF (medium-density fiberboard), roughly range between 300 and 1000 kg/m^3 in density, and are normally available in the form of flat panels of given thicknesses.

[0007] The method according to the invention is extremely straightforward and cheap to implement, and provides for obtaining extremely lightweight, high-quality, relatively cheap steering wheels.

[0008] The agglomerate of wood fibers used in the method according to the invention (hereinafter referred to by the commonly used term MDF), and which has never before been used for this particular application, is not only extremely lightweight, cheap and easy to work (particularly when compared with the types of wood normally used in the automotive industry), but may also be considered "ecological" by normally comprising recycled material or waster material from the wood-working industry.

[0009] A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figures 1 to 6 show, schematically, respective steps in the method of producing a steering wheel according to the invention;

Figures 7 to 10 show, schematically, a possible variation of the method according to the invention;

Figure 11 shows a further variation of the method according to the invention.

[0010] With reference to Figures 1 to 6, an MDF panel 1 (Figure 1) is cut to form a one-piece body 2 defined by two flat opposite surfaces 3, 4 and in the shape of at least a curved ring portion or a continuous ring corresponding to the shape of the steering wheel being produced. To obtain a longer ring portion or even a whole ring, a number of consecutive bodies 2 (Figure 2) may be formed with, at opposite longitudinal ends, respective overlapping gluing portions 5, 6 of a thickness equal to substantially half the thickness of bodies 2 (i.e. of panel 1).

[0011] Surface 3 of body 2 is then machined, e.g. using a numerical-control tool, to form a longitudinal projection 7 (Figure 3); two parallel, circumferential channels 8 are formed a given distance apart on respective sides of projection 7; and projection 7, defined between channels 8, is rounded to form a concave outer surface constituting a work surface 9. A semifinished part 10 is thus obtained comprising a substantially flat bottom portion 11 from which projection 7 extends, and which extends laterally on both sides of projections 7 in the form of respective substantially flat supporting surfaces 12 (defined, in the example shown, by respective bottom walls of channels 8).

[0012] Part 10 (Figure 4) is used as a bottom die to hot press apply a covering 13 of quality material (defined, for example, by at least one veneer layer of brier, kevlar or aluminium). Covering 13 (possibly formed beforehand into a shell) is placed on work surface 9 with the interposition of a polymer bonding agent, and is pressed onto work surface 9 by the pressure exerted by a top die 14 on part 10 acting as the bottom die. Top die 14 comprises a cavity 15 corresponding to projection 7 complete with covering 13; and substantially flat, lateral supporting surfaces 16 which mate with respective supporting surfaces 12 of bottom portion 11. Part 10, complete with covering 13, is then machined further to form a corresponding curved half-shell 17 (Figure 5). More specifically, besides removing the surplus parts of part 10 projecting laterally with respect to projection 7, a longitudinal groove 18 is also formed, e.g. machined, on surface 4, and of such a shape and size as to fit onto a portion 19 of a known supporting core of the steering wheel being produced.

[0013] Half-shell 17 is then applied and fixed to core portion 19. More specifically, two specular half-shells 17 are fitted, facing each other and with respective surfaces 4 contacting each other, about and on opposite sides of portion 19, so as to form a substantially continuous tubular shell 20 covering portion 19. Half-shells 17 are glued to each other along surfaces 4 and possibly also directly to core portion 19 along the inner walls of grooves 18.

[0014] A steering wheel 21 (of generally known form and therefore shown only partly in Figure 6 for the sake of simplicity) is thus obtained comprising a supporting core, e.g. of metal, at least one portion 19 of which is fitted on opposite sides with two curved half-shells 17 defined by respective contoured bodies, each formed in one piece from an agglomerate of wood fibers; and the work surfaces 9 of half-shells 17, to which respective coverings 13 of quality material are applied, mate to form a substantially continuous, outer lateral grip surface 22 of steering wheel 21, on which various known finishing operations may obviously be performed.

[0015] In one possible variation of the method according to the invention, shown schematically in Figures 7 to 10 (in which any details similar to or identical with those already described are indicated using the same reference numbers), part 10, as opposed to being formed from an MDF panel, is formed by hot pressing (Figure 7), in which a predetermined quantity of cellulose/wood fibers and polymer resin binders in non-agglomerated pulp form is placed inside a curved contoured bottom mold 23 comprising a vessel 24, in the bottom surface 25 of which is formed a cavity 26 reproducing projection 7 to be formed on part 10; and contoured bottom mold 23 is closed by a substantially flat contoured top mold 27 to form the Figure 8 part 10 comprising base portion 11, supporting surfaces 12 and projection 7. Pressing temperature, pressure and time are selected to transform the starting material from pulp form to a compact solid agglomerate.

[0016] In this variation, groove 18 can be formed simultaneously with the pressing of part 10, using a contoured top mold 27 comprising a projection 28 (shown by the dash line in Figure 7) defining groove 18, or may be machined as before to any appropriate shape (Figure 9a). Longitudinal or transverse reinforcing elements 29 (Figure 9b), defined for example by laminated wood or metal strips, preferably of 1 to 2 mm in thickness, may also be incorporated in part 10, and in particular in projection 7, and may be inserted inside vessel 24 of contoured bottom mold 23 and incorporated in part 10 when hot pressing part 10 itself.

[0017] This is followed (Figure 10) by a hot pressing step, identical to the one already described, to apply covering 13 to work surface 9, and wherein part 10 is used as a bottom die to apply covering 13. Covering 13 is therefore glued to and pressed onto work surface 9 by top die 14 comprising cavity 15 and substantially flat lateral supporting surface 16 mating with the supporting surfaces 12 of bottom portion 11.

[0018] In a further variation shown schematically in Figure 11, covering 13 of quality material is co-molded onto work surface 9 of part 10 when hot pressing part 10 itself. For which purpose, covering 13 (possibly formed beforehand in shell form) is placed inside cavity 26 of contoured bottom mold 23; contoured bottom mold 23 is filled with the predetermined quantity of cellulose/wood fibers and polymer resin binders, in non-agglomerated pulp form, required to produce part 10; and, once contoured bottom mold 23 is closed by top mold 14 (possibly comprising projection 28), pressing is performed at the temperature and pressure conditions and for the time required to transform the starting material from pulp form to a compact solid agglomerate and to bond covering 13 to it. In this case, too, reinforcing elements 29 may be incorporated in part 10, in which case, the reinforcing elements are placed beforehand inside vessel 24 of contoured mold 23, together with covering 13.

[0019] Clearly, changes may be made to the method and steering wheel as described and illustrated herein without, however, departing from the scope of the present invention.

Claims

1. A method of producing vehicle steering wheels, in particular wooden steering wheels with a quality material covering, **characterized by** comprising the steps of:

   - forming a semifinished part (10) from an agglomerate of wood fibers; said part (10) being defined by a body (2) in the shape of at least a curved ring portion corresponding to the shape of the steering wheel being produced, and comprising a longitudinal projection (7) having a

concave work surface (9);

- using said part (10) as a bottom die to apply a covering (13) of quality material; said covering (13) being applied to said work surface (9) of said part (10), between said part (10) acting as a bottom die and a corresponding top die (14);
- forming from said part (10) a corresponding curved half-shell (17) of such a shape and size as to fit onto a core portion (19) of the steering wheel being produced; and
- applying said half-shell (17) onto said core portion (19).

2. A method as claimed in Claim 1, **characterized in that** said covering (13) of quality material, in particular of brier, kevlar or aluminium, is applied at a first hot pressing step; said covering (13) being applied to said work surface (9) with the interposition of a polymer bonding agent, and being pressed onto said work surface (9) by the pressure exerted by said top die (14) on said part (10) acting as a bottom die.

3. A method as claimed in Claim 2, **characterized by** comprising a step of forming, on a surface (4) of said part (10) opposite said work surface (9), a longitudinal groove (18) for connection to said core portion (19); said groove (18) being of such a shape and size as to fit onto said core portion (19).

4. A method as claimed in Claim 3, **characterized in that** said step of forming said part (10) comprises:

- a step of cutting said body (2), in the form of at least a curved ring portion, from a panel (1) of said agglomerate of wood fibers; and
- a machining step wherein said projection (7) is formed by removing material on both sides of said projection (7).

5. A method as claimed in Claim 3, **characterized in that** said step of forming said part (10) is a second hot pressing step wherein a predetermined quantity of cellulose/wood fibers and polymer resin binders in non-agglomerated pulp form is inserted inside a contoured bottom mold (23) having a cavity (26) reproducing said projection (7).

6. A method as claimed in Claim 5, **characterized in that** said second hot pressing step is performed together with said first hot pressing step, so that said covering (13) of quality material is co-molded onto said work surface (9) of the part (10) at the same hot pressing step in which said part (10) is formed; said covering (13) being inserted beforehand inside said contoured bottom mold (23), on a bottom surface of said cavity (26), prior to inserting said predetermined quantity of cellulose/wood fibers and polymer resin binders in non-agglomerated pulp form.

7. A method as claimed in one of Claims 3 to 6, **characterized in that** said step of forming said groove (18) is a machining step.

8. A method as claimed in Claim 5 or 6, **characterized in that** said step of forming said groove (18) is performed simultaneously with said second pressing step using a contoured top mold (27) having a projection (28) defining said groove (18).

9. A method as claimed in any one of the foregoing Claims, **characterized in that**, at said step of forming said part (10), said part (10) is so formed as to comprise a substantially flat bottom portion (11) from which projects said projection (7); said bottom portion (11) extending laterally on both sides of said projection (7) in the form of respective substantially flat supporting surfaces (12).

10. A vehicle steering wheel, **characterized by** being formed using the method as claimed in any one of the foregoing Claims.

11. A vehicle steering wheel (21) comprising a supporting core, and at least two curved half-shells (17) fitted about and on opposite sides of at least one corresponding core portion (19) to form a substantially continuous tubular shell (20) covering said core portion (19); the steering wheel (21) being **characterized in that** said half-shells (17) are defined by respective contoured bodies, each formed in one piece from an agglomerate of wood fibers, and having respective concave work surfaces (9); and **in that** respective coverings (13) of quality material, e. g. brier, kevlar or aluminium, are applied to said work surfaces (9).

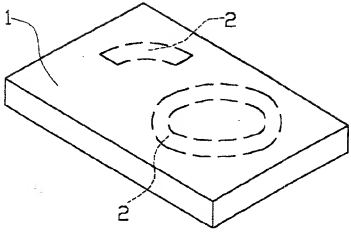


Fig. 1

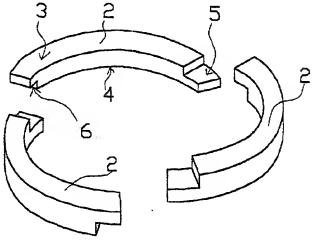


Fig. 2

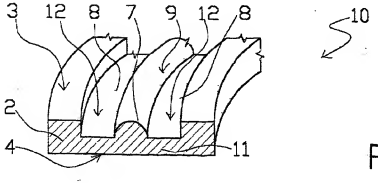


Fig. 3

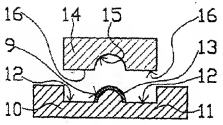


Fig. 4

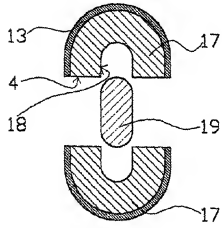


Fig. 5

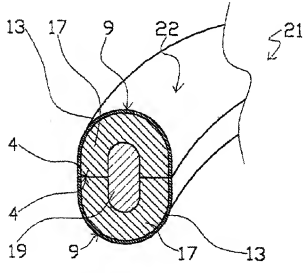


Fig. 6

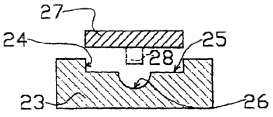


Fig. 7

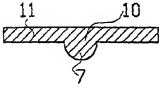


Fig. 8

Fig. 9 a

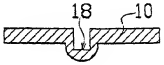
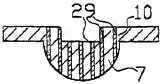


Fig. 9 b



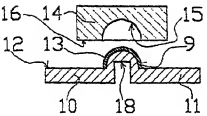


Fig. 10

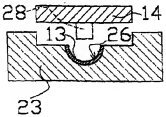


Fig. 11